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REMARKS

1) The Examiner has rejected claims 1, 8, 9, 12, 18-21, 23, and 29 under 35 U.S.C. 112, second paragraph, as being indefinite.

a) Regarding claims 1, 8, and 9, the Examiner asserts that it is unclear whether the nucleophile of claim 1 is the same or different from the nucleophilic additive of claims 8 and 9. Applicants wish to point out that this issue is now moot in view of the instant amendment, where the word "nucleophile" has been removed from claim 1. For this reason, it is urged that the rejections of claims 1, 8, and 9 have been overcome by the instant amendment.

In addition, it is urged the specification clearly states that the composition may *further* comprise a nucleophilic additive, which accelerates the crosslinking of the composition. Examples of such a nucleophilic additive include dimethyl sulfone, dimethyl formamide, hexamethylphosphorous triamide (HMPT), amines and combinations thereof. Applicants submit that one skilled in the art would clearly understand that the nucleophilic additive is a separate component which may be present in the composition *in addition to* the catalyst. It is further urged that those skilled in the art would be able to clearly distinguish a primary catalyst from a nucleophilic additive which serves to accelerate the crosslinking of the composition, based on both their general knowledge in the art as well as the examples given in the specification.

b) Regarding claims 12 and 21, the Examiner asserts that the term "amu" is unclear. Applicants respectfully urge that it is clearly shown in both the claims and the specification that term "amu" refers to a unit of molecular weight. It is urged that those of ordinary skill in the art would clearly understand that this term stands for "atomic mass unit".

c) The Examiner next asserts that there is no antecedent basis for the word "step" in claims 18-20. Applicants have amended claim 18 to remove the word "the" from the phrase "the step (c)" for consistency, and the phrase has been amended to now read "wherein step (c) comprises a crosslinking which is conducted...". Furthermore, Applicants urge that it is widely accepted in U.S. patent practice to list various actions of a method claim using symbols such as "(a)", "(b)", "(c)", and the like, and to later refer to each symbol as a "step" in the dependent claims, even where the word "step" does not appear in the independent claim itself. That is, it is submitted that the word "step" may be properly inferred where an action is designated by such a symbol. A search of the U.S. Patent and Trademark Office website yielded thousands of granted U.S. patents having dependent claims referring to such "steps". Therefore, it is urged that this wording does not render claims 18-20 indefinite, and this ground of rejection should be withdrawn.

d) Regarding claim 23, the Examiner states that it is not clear if the alkyl chain and alkyl ether moiety are one and the same or not. Applicants respectfully submit that one skilled in the art would readily understand that an alkyl ether has an R-O-R' structure, such as CH_2-O-CH_2 or the like, while an alkyl chain has a C_nH_{2n+1} structure, such as $CH_3CH_2CH_2$- or the like. It is urged that one skilled in the art would easily understand the chemical structures associated with a polyalkylene oxide monoether porogen of claim 23.

e) Finally, the Examiner asserts that it is not clear how an entire compound of claim 39 can be considered a leaving group. Applicants respectfully submit that the claim does not disclose an *entire compound* as a leaving group, but rather a pre-polymer compound which *includes* acetoxy-based leaving groups. That is, the specification provides an embodiment where the silicon containing pre-polymer comprises an alkoxysilane compound, and wherein said alkoxysilane pre-polymer compound may be replaced by a pre-polymer compound having acetoxy-based and/or halogen-based leaving groups. The specification further discloses that preferred acetoxy-derived prepolymers include tetraacetoxysilane, methyltriacetoxysilane and/or combinations thereof. Claim 39 has

thus been amended for clarity, to now read: "wherein said silicon containing pre-polymer comprising a combination of acetoxy-based leaving groups comprises tetraacetoxysilane and methyltriacetoxysilane". It is respectfully urged that the rejection of claim 39 has been overcome by the instant amendment. For all of the above reasons, it is respectfully requested that the 35 U.S.C. 112 rejections be withdrawn.

2) The Examiner has objected to claims 1-47 for an inconsistent spelling of the word prepolymer/pre-polymer. Claims 11 and 12 are now amended such that the word "prepolymer" is changed to pre-polymer for consistency with claim 1. Applicants respectfully urge that the objection to the claims has been overcome by the instant amendment, and should be withdrawn.

3) The Examiner has rejected claims 1-46 under the non-statutory, judicially created doctrine of obviousness-type double patenting over claims 1-42 of copending U.S. patent application serial number 10/507411. Applicants submit a terminal disclaimer herewith under 37 CFR 1.321 since the conflicting patent application is commonly owned with this application. It is therefore respectfully requested that the above double patenting rejection be withdrawn.

4) The Examiner has rejected claims 34-37 and 44-47 under 35 U.S.C. 102 over EP 1142832. Applicants respectfully urge that this ground of rejection should be withdrawn.

It should be noted that claims 34-37 and 44-45 have been amended, and claims 46-47 have been canceled. Claim 34, as currently amended, relates to a nanoporous silica dielectric film formed from a composition comprising a silicon containing pre-polymer, a porogen, and a catalyst selected from the group consisting of tetramethylammonium acetate, tetrabutylammonium acetate, tetramethylphosphonium acetate, tetramethylphosphonium hydroxide, triphenylphosphine, trimethylphosphine, trioctylphosphine, and combinations thereof, which nanoporous silica dielectric film is *produced according to the method of claim 1*. Since claim 1 has not been rejected as being anticipated by EP 1142832, it is implicit that claim 1 is considered by the Examiner

to be novel in view of this reference. Applicants therefore urge that claims 34-37 and 44-45 should be considered novel as well, since each of these dependent claims provide a *narrower* embodiment of the invention disclosed in claim 1.

Regarding the Examiner's comments, he first asserts that EP 1142832 teaches "a porous, low dielectric Si composition". This is incorrect. Applicants wish to point out that the compositions formed by EP1142832 do not have any porous properties when present in the form of a composition. In addition, it is urged that the cited reference does not disclose a composition having a porogen, as required by the present claims, but rather they disclose the presence of a *surfactant*. It is urged that such surfactants possess vastly different properties than the present porogens. As is stated in paragraph [0008] of this reference, the surfactant possesses a hydrophilic head group or groups with a strong affinity for water, and a hydrophobic tail which repels water. As such, the long hydrophobic tail acts as a template member in the later formation of a porous film. These surfactants and their structures are very different from the presently used porogens, which produce pores via a chemical bonding between the porogen and a silicon based precursor, as is exhibited by most conventionally known porogens in the field of integrated circuit dielectrics. It is therefore urged that the surfactant of the cited reference should not be considered to be analogous to the porogens required by the present claims.

The Examiner next points out that EP 1142832 teaches the use of tetramethylammonium acetate, as a nucleophilic additive. Indeed, the present invention discloses the use of tetramethylammonium acetate as a metal-ion-free catalyst. However, it is urged that the tetramethylammonium acetate of the cited reference does not serve as the catalyst component of their composition. Rather, EP 1142832 requires the presence of tetramethylammonium acetate as an additive to balance undesired effects caused by the use of a purified surfactant. Consequently, the reference includes a separate catalyst, such as HCl, *in addition* to the tetramethylammonium acetate additive. As such, it is urged that the tetramethylammonium acetate of EP 1142832 serves a purpose different than that of the presently claimed metal-ion-free catalysts, and should not be considered analogous to the required catalysts of the present claims.

Next the Examiner states that the cited reference discloses propylene glycol monopropyl ether as a porogen. This is not the case. First, it should be pointed out that this material is *clearly* disclosed in EP 1142832 as a solvent. Furthermore, it is urged that this material does not appear *anywhere* in the present disclosure. Thus, Applicants fail to see the Examiner's motivation in pointing to the presence of this material in the cited art, since it is absent in the present disclosure.

Applicants further wish to point out that, in the corresponding U.S. PCT application, this same Examiner stated that claims 1-47 have novelty, inventive step, and industrial applicability in view of this EP 1142832 reference.

It is urged that the presently claimed invention is patentably distinct from EP 1142832. Applicants therefore respectfully request that the 35 U.S.C. 102 rejection be withdrawn.

5) The Examiner has rejected claims 34-36, 38-40, and 43-47 under 35 U.S.C. 102 over WO 2001/86709. The Examiner asserts that WO 2001/86709 teaches a porous film having a polymer pre-cursor of tetraaxetoxysilane and methyltriacetoxysilane, a porogen of polyethylene glycol monomethylether or polypropylene glycol monobutyl ether, and an amine or acid catalyst of tetramethylammonium hydroxide. It is urged that these assertions are now moot in view of the above amendments.

As shown above, claims 34-36, 38-40, and 43-45 have been amended, and claims 46-47 have been canceled. Claim 34, as currently amended, relates to a nanoporous silica dielectric film formed from a composition comprising a silicon containing pre-polymer, a porogen, and a catalyst selected from the group consisting of tetramethylammonium acetate, tetrabutylammonium acetate, tetramethylphosphonium acetate, tetramethylphosphonium hydroxide, triphenylphosphine, trimethylphosphine, trioctylphosphine, and combinations thereof, which nanoporous silica dielectric film is *produced according to the method of claim 1*. Applicants urge that each of amended claims 34-36, 38-40, and 43-45 relate to *narrower* embodiments of the invention

disclosed in claim 1. Since claim 1 has not been rejected as being anticipated by WO 2001/86709, it is implicit that claim 1 is considered by the Examiner to be novel in view of this reference. Thus, Applicants respectfully submit that all of these rejected claims depending from claim 1 should be considered novel in view of WO 2001/86709.

Furthermore, in forming the inventive a nanoporous silica dielectric films, it is required to *crosslink* the composition coated on the substrate, in order to produce a gelled film. Such is not taught by WO 2001/86709. Rather, the reference teaches an aging or condensing of their film in the presence of water and *without the application of external heat* (see col.3, lines 9-13; and col.4 line 66 through col.5, line 9). While they do state that one may optionally "hasten the solidification of the film" by heating at 25-200°C, it is urged that this reference still fails to specifically teach a *crosslinking* of the material.

In addition, Applicants wish to point out that WO 2001/86709 fails to disclose a composition having a catalyst selected from the group required by the presently amended claims. The reference teaches the presence of an optional base catalyst in their precursor composition, which base preferably comprises an amine of a particular pKb, which will turn the precursor composition alkaline. They list tetramethyl ammonium hydroxide as an amine in this case. It can be inferred that WO 2001/86709 includes this material in their list of catalysts for the hydroxide component, in forming alkaline compositions. As such, the present claims have been amended to only include non-amine catalysts since it is not a point of this invention to form highly alkaline compositions. The present claims as amended require a catalyst which is selected from the group consisting of tetramethylammonium acetate, tetrabutylammonium acetate, tetramethylphosphonium acetate, tetramethylphosphonium hydroxide, triphenylphosphine, trimethylphosphine, trioctylphosphine, and combinations thereof. A composition having a catalyst of this group is not taught by WO 2001/86709. It is therefore urged that the amended claims are clearly patentably distinct from WO 2001/86709, and that the 35 U.S.C. 102 rejection should be withdrawn.

6) The Examiner has rejected claims 41-42 under 35 U.S.C. 103 over EP 1142832 or WO 2001/86709 in view of U.S. 6,673,847 to Jiang. It should be noted that both claims 41 and 42 depend from claim 34. Since claim 34 has *not* been rejected by the Examiner as being obvious in view of either EP1142832 or WO 2001/86709, it is urged that neither of claims 41 nor 42 should be considered obvious, since said dependent claims each provide a *narrower* embodiment of the invention disclosed in claim 34.

Jiang is cited for teaching a porogen comprises polypropylene glycol dimethylether or polyethylene glycol dimethylether, as required by the present claims 41 and 42. Whether or not Jiang teaches such porogens is immaterial in view of the above arguments against EP1142832 and WO 2001/86709. That is, since claim 34 was not considered obvious in view of either of these references, the additional citing of Jiang to provide an additional feature of dependent claims 41 or 42 is moot.

Furthermore, it should again be noted that in the corresponding U.S. PCT application, this same Examiner stated that claims 1-47 have novelty, inventive step, and industrial applicability in view of this EP 1142832 reference. For all of the above reasons, it is respectfully urged that the 35 U.S.C. 103 rejection should be withdrawn.

7) The Examiner has rejected claims 1-33 under 35 U.S.C. 103 over WO 2001/86709. The Examiner asserts that it would be obvious for one skilled in the art to formulate the present invention upon a reading of WO 2001/86709. Applicants respectfully submit that this ground of rejection has been overcome by the instant amendment.

The present claim 1, as amended, relates to a method of producing a nanoporous silica dielectric film comprising:
(a) preparing a composition comprising a silicon containing pre-polymer, a porogen, and a metal-ion-free catalyst selected from the group consisting of tetramethylammonium acetate, tetrabutylammonium acetate, tetramethylphosphonium acetate, tetramethylphosphonium hydroxide, triphenylphosphine, trimethylphosphine, trioctylphosphine, and combinations thereof;

(b) coating a substrate with the composition to form a film,
(c) crosslinking the composition to produce a gelled film, and
(d) heating the gelled film at a temperature and for a duration effective to remove substantially all of said porogen.

WO 2001/86709relates to the formation of nanoporous dielectric films. Indeed WO 2001/86709 discloses a process which includes forming a precursor composition having a porogen, coating a substrate with the precursor to form a film, condensing the film, and heating the film to remove the porogen. However, it is urged that WO 2001/86709 fails to teach or suggest the presently claimed composition having our particular combination of components. Although WO 2001/86709 may disclose a certain porogen or silicon-containing pre-polymer in common with our invention, they fail to disclose a composition which comprises our particular catalysts of the present claims, as amended. Specifially, WO 2001/86709 *fails to teach* the presence of an internal catalyst selected from the group consisting of tetramethylammonium acetate, tetrabutylammonium acetate, tetramethylphosphonium acetate, tetramethylphosphonium hydroxide, triphenylphosphine, trimethylphosphine, trioctylphosphine, and combinations thereof.

Furthermore, as stated above, the present claims require a *crosslinking* of the inventive composition coated on the substrate, in order to produce a gelled film. Such is not taught by WO 2001/86709. Rather, the reference teaches an aging or condensing of their film in the presence of water and *without the application of external heat* (see col.3, lines 9-13; and col.4 line 66 through col.5, line 9). While they do state that one may optionally "hasten the solidification of the film" by heating at 25-200°C, it is urged that this reference still fails to specifically teach a *crosslinking* of the material. The Examiner asserts that it would be inherent that crosslinking occurs where the reference uses the same materials and the same processes of the present invention. Applicants first point out that WO 2001/86709 fails to teach a composition containing the catalysts required by the presently amended claims. Furthermore, it is urged that while the reference may disclose an optional heating step having a small overlapping temperature range with the present disclosure, there is no indication that the same processes are used.

For the above reasons, it is respectfully urged that one skilled in the art would not be inspired to devise a nanoporous silica dielectric film formed from the compositions of the presently amended claims, upon a reading of WO 2001/86709. It is therefore respectfully requested that the 35 U.S.C. 103 rejection be withdrawn.

The undersigned respectfully requests re-examination of this application and believes it is now in condition for allowance. Such action is requested. If the Examiner believes there is any matter which prevents allowance of the present application, it is requested that the undersigned be contacted to arrange for an interview which may expedite prosecution.

Respectfully submitted,

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I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office (FAX No. 571-273-8300) on November 30, 2007.

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